

Table 3-1
ONE-HOUR AVERAGE CONCENTRATION FOR AMMONIA^{1,2}

Waters Designated as COLD, COLD with SPWN, COLD with MIGR (Salmonids or other sensitive coldwater species present)

	Temperature, °C						
pH	0	5	10	15	20	25	30
Un-ionized Ammonia (mg/liter NH ₃)							
6.50	0.0091	0.0129	0.0182	0.026	0.036	0.036	0.036
6.75	0.0149	0.021	0.030	0.042	0.059	0.059	0.059
7.00	0.023	0.033	0.046	0.066	0.093	0.093	0.093
7.25	0.034	0.048	0.068	0.095	0.135	0.135	0.135
7.50	0.045	0.064	0.091	0.128	0.181	0.181	0.181
7.75	0.056	0.080	0.113	0.159	0.22	0.22	0.22
8.00	0.065	0.092	0.130	0.184	0.26	0.26	0.26
8.25	0.065	0.092	0.130	0.184	0.26	0.26	0.26
8.50	0.065	0.092	0.130	0.184	0.26	0.26	0.26
8.75	0.065	0.092	0.130	0.184	0.26	0.26	0.26
9.00	0.065	0.092	0.130	0.184	0.26	0.26	0.26
Total Ammonia (mg/liter NH ₃)							
6.50	35	33	31	30	29	20	14.3
6.75	32	30	28	27	27	18.6	13.2
7.00	28	26	25	24	23	16.4	11.6
7.25	23	22	20	19.7	19.2	13.4	9.5
7.50	17.4	16.3	15.5	14.9	14.6	10.2	7.3
7.75	12.2	11.4	10.9	10.5	10.3	7.2	5.2
8.00	8.0	7.5	7.1	6.9	6.8	4.8	3.5
8.25	4.5	4.2	4.1	4.0	3.9	2.8	2.1
8.50	2.6	2.4	2.3	2.3	2.3	1.71	1.28
8.75	1.47	1.40	1.37	1.38	1.42	1.07	0.83
9.00	0.86	0.83	0.83	0.86	0.91	0.72	0.58

1 To convert these values to mg/liter N, multiply by 0.822

2 Source: U. S. Environmental Protection Agency. 1986. Quality criteria for water, 1986. EPA 440/5-86-001.

Table 3-2
ONE-HOUR AVERAGE CONCENTRATION FOR AMMONIA^{1,2}

Waters designated WARM, WARM with SPWN, WARM with MIGR (Salmonids or other sensitive coldwater species absent)³

	Temperature, °C						
pH	0	5	10	15	20	25	30
Un-ionized Ammonia (mg/liter NH ₃)							
6.50	0.0091	0.0129	0.0182	0.026	0.036	0.051	0.051
6.75	0.0149	0.021	0.030	0.042	0.059	0.084	0.084
7.00	0.023	0.033	0.046	0.066	0.093	0.131	0.093
7.25	0.034	0.048	0.068	0.095	0.135	0.190	0.190
7.50	0.045	0.064	0.091	0.128	0.181	0.26	0.26
7.75	0.056	0.080	0.113	0.159	0.22	0.32	0.32
8.00	0.065	0.092	0.130	0.184	0.26	0.37	0.37
8.25	0.065	0.092	0.130	0.184	0.26	0.37	0.37
8.50	0.065	0.092	0.130	0.184	0.26	0.37	0.37
8.75	0.065	0.092	0.130	0.184	0.26	0.37	0.37
9.00	0.065	0.092	0.130	0.184	0.26	0.37	0.37
Total Ammonia (mg/liter NH ₃)							
6.50	35	33	31	30	29	29	20
6.75	32	30	28	27	27	26	18.6
7.00	28	26	25	24	23	23	16.4
7.25	23	22	20	19.7	19.2	19.0	13.5
7.50	17.4	16.3	15.5	14.9	14.6	14.5	10.3
7.75	12.2	11.4	10.9	10.5	10.3	10.2	7.3
8.00	8.0	7.5	7.1	6.9	6.8	6.8	4.9
8.25	4.5	4.2	4.1	4.0	3.9	4.0	2.9
8.50	2.6	2.4	2.3	2.3	2.3	2.4	1.81
8.75	1.47	1.40	1.37	1.38	1.42	1.52	1.18
9.00	0.86	0.83	0.83	0.86	0.91	1.01	0.82

1 To convert these values to mg/liter, multiply by 0.822

2 Source: U. S. Environmental Protection Agency. 1986. Quality criteria for water, 1986. EPA 440/5-86-001.

3 These values may be conservative, however, if a more refined criterion is desired, USEPA recommends a site-specific criteria modification.

Table 3-3
FOUR DAY AVERAGE CONCENTRATION FOR AMMONIA^{1,2}

Waters Designated as COLD, COLD with SPWN, COLD with MIGR (Salmonids or other sensitive coldwater species present)

	Temperature, °C						
pH	0	5	10	15	20	25	30
Un-ionized Ammonia (mg/liter NH ₃)							
6.50	0.0008	0.0011	0.0016	0.0022	0.0022	0.0022	0.0022
6.75	0.0014	0.0020	0.0028	0.0039	0.0039	0.0039	0.0039
7.00	0.0025	0.0035	0.0049	0.0070	0.0070	0.0070	0.0070
7.25	0.0044	0.0062	0.0088	0.0124	0.0124	0.0124	0.0124
7.50	0.0078	0.0111	0.0156	0.022	0.022	0.022	0.022
7.75	0.0129	0.0182	0.026	0.036	0.036	0.036	0.036
8.00	0.0149	0.021	0.030	0.042	0.042	0.042	0.042
8.25	0.0149	0.021	0.030	0.042	0.042	0.042	0.042
8.50	0.0149	0.021	0.030	0.042	0.042	0.042	0.042
8.75	0.0149	0.021	0.030	0.042	0.042	0.042	0.042
9.00	0.0149	0.021	0.030	0.042	0.042	0.042	0.042
Total Ammonia (mg/liter NH ₃)							
6.50	3.0	2.8	2.7	2.5	1.76	1.23	0.87
6.75	3.0	2.8	2.7	2.6	1.76	1.23	0.87
7.00	3.0	2.8	2.7	2.6	1.76	1.23	0.87
7.25	3.0	2.8	2.7	2.6	1.77	1.24	0.88
7.50	3.0	2.8	2.7	2.6	1.78	1.25	0.89
7.75	2.8	2.6	2.5	2.4	1.66	1.17	0.84
8.00	1.82	1.70	1.62	1.57	1.10	0.78	0.56
8.25	1.03	0.97	0.93	0.90	0.64	0.46	0.33
8.50	0.58	0.55	0.53	0.53	0.38	0.28	0.21
8.75	0.34	0.32	0.31	0.31	0.23	0.173	0.135
9.00	0.195	0.189	0.189	0.195	0.148	0.116	0.094

1 To convert these values to mg/liter N, multiply by 0.822.

2 Source: U. S. Environmental Protection Agency. 1992. Revised tables for determining average freshwater ammonia concentrations. USEPA Office of Water Memorandum, July 30, 1992.

Table 3-4
FOUR DAY AVERAGE CONCENTRATION FOR AMMONIA^{1,2}

Waters designated WARM, WARM with SPWN, WARM with MIGR (Salmonids or other sensitive coldwater species absent)³

	Temperature, °C						
pH	0	5	10	15	20	25	30
Un-ionized Ammonia (mg/liter NH ₃)							
6.50	0.0008	0.0011	0.0016	0.0022	0.0031	0.0031	0.0031
6.75	0.0014	0.0020	0.0028	0.0039	0.0055	0.0055	0.0055
7.00	0.0025	0.0035	0.0049	0.0070	0.0099	0.0099	0.0099
7.25	0.0044	0.0062	0.0088	0.0124	0.0175	0.0175	0.0175
7.00	0.0078	0.0111	0.0156	0.022	0.031	0.031	0.031
7.75	0.0129	0.0182	0.026	0.036	0.051	0.051	0.051
8.00	0.0149	0.021	0.030	0.042	0.059	0.059	0.059
8.25	0.0149	0.021	0.030	0.042	0.059	0.059	0.059
8.50	0.0149	0.021	0.030	0.042	0.059	0.059	0.059
8.75	0.0149	0.021	0.030	0.042	0.059	0.059	0.059
9.00	0.0149	0.021	0.030	0.042	0.059	0.059	0.059
Total Ammonia (mg/liter NH ₃)							
6.50	3.0	2.8	2.7	2.5	2.5	1.73	1.23
6.75	3.0	2.8	2.7	2.6	2.5	1.74	1.23
7.00	3.0	2.8	2.7	2.6	2.5	1.74	1.23
7.25	3.0	2.8	2.7	2.6	2.5	1.75	1.24
7.50	3.0	2.8	2.7	2.6	2.5	1.76	1.25
7.75	2.8	2.6	2.5	2.4	2.3	1.65	1.18
8.00	1.82	1.70	1.62	1.57	1.55	1.10	0.79
8.25	1.03	0.97	0.93	0.90	0.90	0.64	0.47
8.50	0.58	0.55	0.53	0.53	0.53	0.39	0.29
8.75	0.34	0.32	0.31	0.31	0.32	0.24	0.190
9.00	0.195	0.189	0.189	0.195	0.21	0.163	0.133

1 To convert these values to mg/liter N, multiply by 0.822.

2 Source: U. S. Environmental Protection Agency. 1992. Revised tables for determining average freshwater ammonia concentrations. USEPA Office of Water Memorandum, July 30, 1992.

3 These values may be conservative, however, if a more refined criterion is desired, USEPA recommends a site-specific criteria modification.

**Table 3-5
EXAMPLE AMMONIA SPREADSHEET OUTPUT
(USEPA AMMONIA CRITERIA CALCULATOR*)**

Required user inputs: 1-h Temp. Cap = 20°; 4-d Temp. Cap = 15°; Temp., °C = 10; pH = 7.0

One-hour criteria not to exceed, mg/L as NH₃

Parameter	0<T<TCAP			TCAP<T<30		
	6.5<pH<7.7	7.7<pH<8.0	8.0<pH<9.0	6.5<pH<7.7	7.7<pH<8.0	8.0<pH<9.0
FT	1.995	1.995	1.995	1.000	1.000	1.000
FPH	2.810	2.810	1.000	2.810	2.810	1.000
Unionized NH ₃	0.0464	0.0464	0.1303	0.0925	0.0925	0.2600
Total NH ₃ +NH ₄	25.0369	25.0369	70.3414	49.9552	49.9552	140.3495

Four-day criteria not to exceed, mg/L as NH₃

Parameter	0<T<TCAP			TCAP<T<30		
	6.5<pH<7.7	7.7<pH<8.0	8.0<pH<9.0	6.5<pH<7.7	7.7<pH<8.0	8.0<pH<9.0
FT	1.995	1.995	1.995	1.413	1.413	1.413
FPH	2.810	2.810	1.000	2.810	2.810	1.000
RATIO	28.899	13.500	13.500	28.899	13.500	13.500
Unionized NH ₃	0.0049	0.0106	0.0297	0.0070	0.0149	0.0420
Total NH ₃ +NH ₄	2.6657	5.7064	16.0322	3.7654	8.0605	22.6461

Chemical thermodynamic constants**

pKa = 9.731432321

f = 0.001852518

* A Microsoft Excel spreadsheet
Use only that temperature and pH column which applies to the input data
T = Temperature, °C; TCAP = Temperature Cap, °C

** pKa: -log K; K is equilibrium constant for ammonium
f is the fraction of unionized NH₃/(Total NH₃+NH₄)

**Table 3-6
WATER QUALITY CRITERIA FOR
AMBIENT DISSOLVED OXYGEN CONCENTRATION^{1,2}**

	Beneficial Use Class			
	COLD & SPWN ³	COLD	WARM & SPWN ³	WARM
30 Day Mean	NA ⁴	6.5	NA	5.5
7 Day Mean	9.5 (6.5)	NA	6.0	NA
7 Day Mean Minimum	NA	5.0	NA	4.0
1 Day Minimum ^{5,6}	8.0 (5.0)	4.0	5.0	3.0

- ¹ From: USEPA. 1986. Ambient water quality criteria for dissolved oxygen. Values are in mg/L.
- ² These are water column concentrations recommended to achieve the required intergravel dissolved oxygen concentrations shown in parentheses. For species that have early life stages exposed directly to the water column (SPWN), the figures in parentheses apply.
- ³ Includes all embryonic and larval stages and all juvenile forms to 30-days following hatching (SPWN).
- ⁴ NA (Not Applicable).
- ⁵ For highly manipulatable discharges, further restrictions apply.
- ⁶ All minima should be considered as instantaneous concentrations to be achieved at all times.

**Table 3-7
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
SURPRISE VALLEY HYDROLOGIC UNIT**

See Fig. 3-1	Surface Water	Objective (mg/L except as noted) ^{1,2}						
		TDS	Cl	SO ₄	% Na	B	Total N	Total P
1	Bidwell Creek	55	1.0	-	-	0.05	0.2	-
2	Mill Creek	70	0.8	-	-	0.02	0.2	-
3	Cedar Creek	100	1.0	-	-	0.03	0.2	-
4	Eagle Creek	60	0.5	-	-	0.02	0.1	-
5	Emerson Creek	90	0.8	-	-	0.01	0.2	-
6	Bear Creek	110	0.6	-	-	0.02	0.1	-

¹ Annual Average Value/90th Percentile Value

² Objectives are as mg/L and are defined as follows:

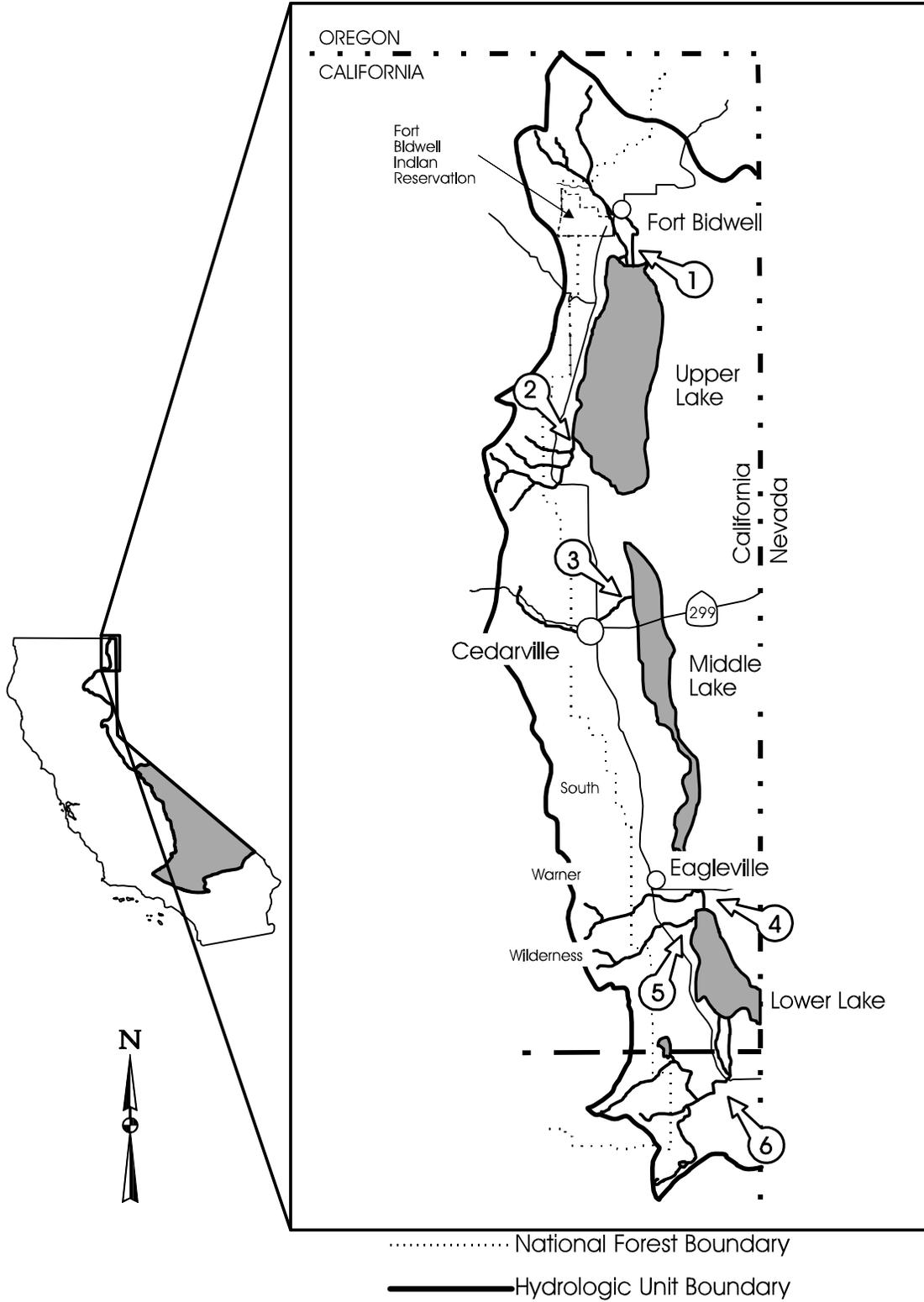
- B Boron
- Cl Chloride
- N Nitrogen, Total
- P Phosphorus, Total
- % Na Sodium, Percent

$$\frac{Na_{100}}{Na + Ca + Mg + K} = \%Na$$

Na, Ca, Mg, K expressed as milliequivalents per liter (meq/L) concentrations.

- SO₄ Sulfate
- TDS Total Dissolved Solids (Total Filterable Residue)

Figure 3-1
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
SURPRISE VALLEY HYDROLOGIC UNIT



**TABLE 3-8
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
SUSANVILLE HU, EAGLE DRAINAGE HA**

See Fig. 3-2	Surface Waters	Objective (mg/L except as noted) ^{1,4}										
		TDS	Cl	SO ₄	NO ₃ -N	TKN	N	P	B	PO ₄	SAR	ALK
1	Eagle Lake: North (Index Stn. 6b)	535	14.0	0.9	0.01	1.0	1.0	0.04 0.30 ²	0.08	0.01 0.20 ²	5.49	445 500 ³
2	Eagle Lake: Middle (Index Stn. 4A)	500	14.0	0.9	0.01	1.0	1.0	0.04 0.30 ²	0.08	0.01 0.20 ²	5.49	430 500 ³
3	Eagle Lake: South (Index Stn. 11)	800	14.0	0.9	0.02	1.3	1.3	0.04 0.30 ²	0.08	0.01 0.20 ²	5.49	470 500 ³
4	Pine Creek	-	0.1	0.9	0.04	0.3	0.4	0.06	0.01	0.02	0.30	-
5	Merrill Creek	-	0.2	0.5	0.02	0.1	0.1	0.02	0.01	0.01	0.23	-
6	Papoose Creek	-	0.1	0.5	0.01	0.3	0.4	0.03	0.01	0.01	0.45	-
7	Grasshopper Creek	-	2.6	-	0.01	0.4	0.4	0.22	0.01	0.06	-	-

¹ Calculated and stipulated in terms of mean of monthly mean for the period of record values, unless otherwise specified.

² Maximum for hypolimnetic waters.

³ Maximum value.

⁴ Objectives are defined as follows:

ALK Alkalinity, Total as CaCO₃

B Boron

Cl Chloride

N Nitrogen, Total

NO₃-N Nitrogen as Nitrate

TKN Nitrogen, Total Kjeldahl

PO₄ Orthophosphate, Dissolved

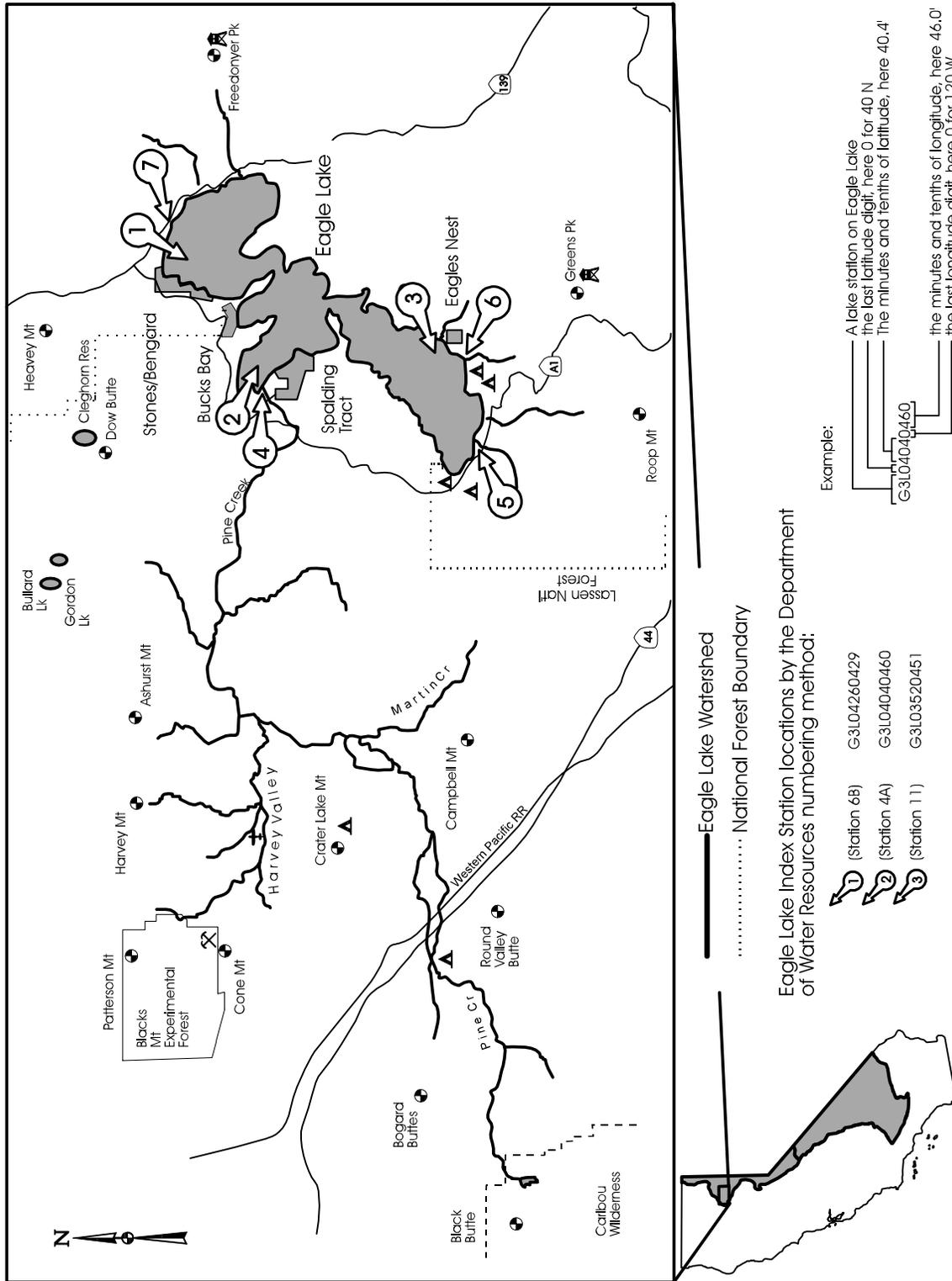
P Phosphorus, Total

SO₄ Sulfate

TDS Total Dissolved Solids (Total Filterable Residue)

$$\frac{Na}{\sqrt{\frac{1}{2} Ca + Mg}}} = SAR$$

Figure 3-2
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
SUSANVILLE HU, EAGLE DRAINAGE HA



**Table 3-9
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
SUSANVILLE HYDROLOGIC UNIT**

See Fig. 3-3	Surface Waters	Objective (mg/L except as noted) ^{1,2}						
		TDS	Cl	SO ₄	ASAR ³	B	N	P
1	Willow Creek at Merrillville Rd	<u>310</u>	<u>9.5</u>	<u>0.4</u>	-	<u>0.01</u>	<u>0.7</u>	<u>0.10</u>
		335	10.0	0.5	-	-	0.8	0.11
2	Willow Creek at Co. Road 216	<u>200</u>	<u>6.6</u>	-	-	<u>0.01</u>	<u>0.6</u>	<u>0.05</u>
		230	-	-	-	-	-	-
3	Willard Creek	<u>40</u>	<u>1.2</u>	-	-	<u>0.01</u>	<u>0.01</u>	<u>0.03</u>
		45	1.5	-	-	-	-	-
4	Cheney Creek	<u>70</u>	<u>0.01</u>	-	-	<u>0.01</u>	<u>0.01</u>	<u>0.03</u>
		75	-	-	-	-	-	-
5	Susan River above Willard Creek	<u>60</u>	<u>0.7</u>	<u>1.0</u>	-	<u>0.01</u>	<u>0.2</u>	<u>0.06</u>
		75	1.0	-	-	-	0.3	-
6	Susan River at Lassen Street	<u>95</u>	<u>2.0</u>	<u>2.0</u>	<u>0.3</u>	<u>0.01</u>	<u>0.30</u>	<u>0.15</u>
		105	5.0	-	-	0.10	0.40	0.25
7	Susan River near Litchfield at Hwy. 395	<u>185</u>	<u>8.0</u>	<u>25</u>	<u>2.5</u>	<u>0.1</u>	<u>0.65</u>	<u>0.25</u>
		250	-	40	-	0.2	0.80	0.30
8	Piute Creek	<u>135</u>	<u>1.0</u>	<u>0.6</u>	-	<u>0.01</u>	<u>0.5</u>	<u>0.14</u>
		155	1.2	0.8	-	-	0.6	0.15
9	Gold Run Creek	<u>40</u>	<u>0.2</u>	-	-	<u>0.01</u>	<u>0.1</u>	<u>0.02</u>
		50	-	-	-	-	-	-
10	Lassen Creek	<u>65</u>	<u>0.01</u>	-	-	<u>0.01</u>	<u>0.4</u>	<u>0.2</u>
		80	-	-	-	-	-	-
11	Baxter Creek	<u>70</u>	<u>0.4</u>	-	-	<u>0.01</u>	<u>0.5</u>	<u>0.12</u>
		75	-	-	-	-	-	-

¹ Annual average value/90th percentile value.

² Objectives are as mg/L and are defined as follows:

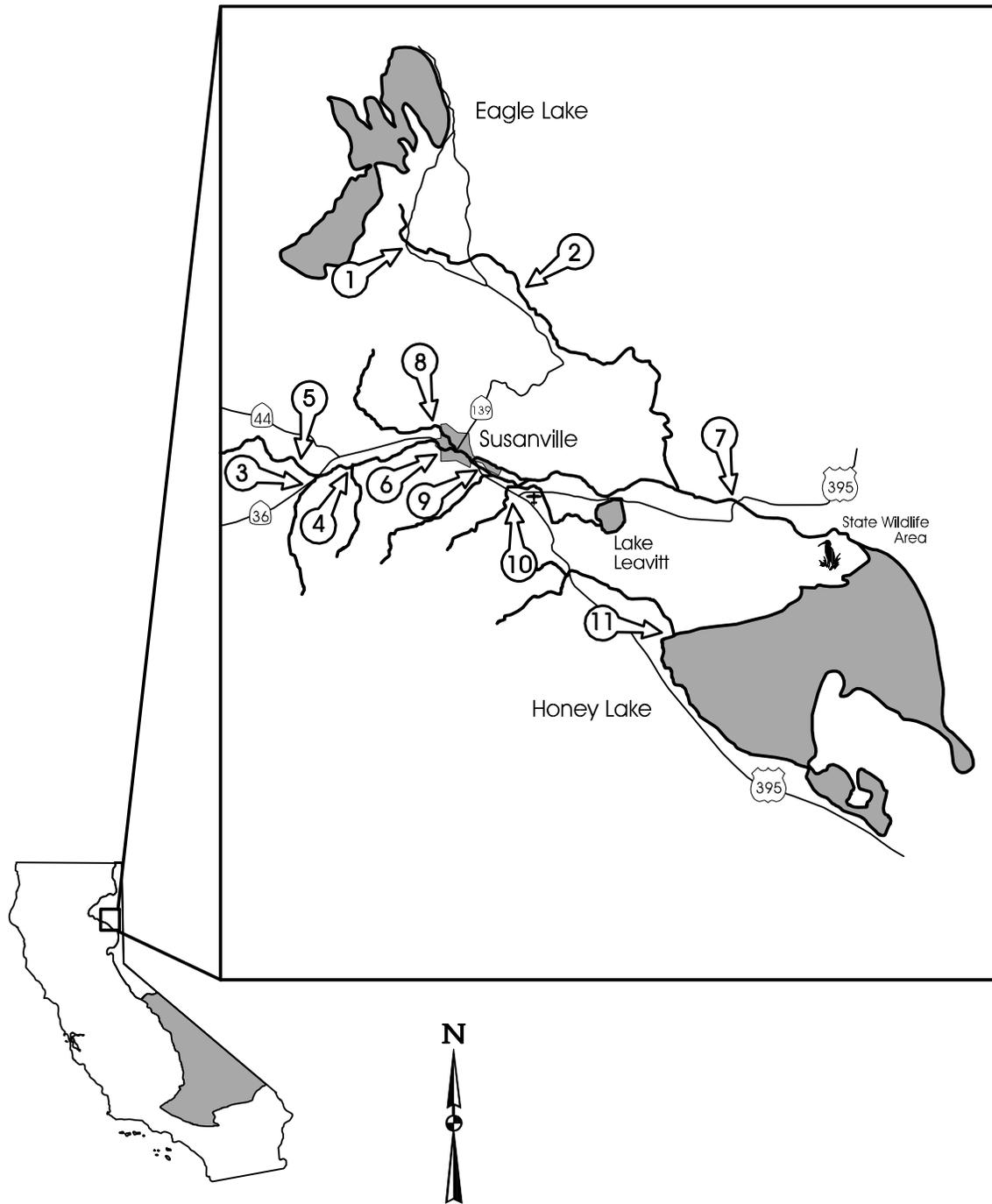
- TDS Total Dissolved Solids (Total Filterable Residue)
- Cl Chloride
- SO₄ Sulfate
- B Boron (maximum)
- N Nitrogen, Total
- P Phosphorus, Total

³ ASAR Adjusted Sodium Adsorption Ratio:

Where concentrations are in milliequivalents per liter and pH_c can be calculated using a Table found in Appendix E.

$$\frac{Na}{\sqrt{\frac{Ca+Mg}{2}}} \frac{1}{1 + 8.4 - pH_c}$$

Figure 3-3
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
SUSANVILLE HYDROLOGIC UNIT



**Table 3-10
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
LITTLE TRUCKEE RIVER HYDROLOGIC UNIT**

See Fig. 3-4	Surface Waters	Objective (mg/L except as noted) ^{1,2}							
		TDS	Cl	SO ₄	Fe	NO ₃ -N	TKN	Total N	Total P
1	Little Truckee River below Boca Reservoir	60	1.0	1.0	.30	0.08	0.32	0.40	0.05
2	Little Truckee River below Independence Creek	45	1.0	1.0	0.13	0.05	0.40	0.45	0.03
3	Independence Lake	35	1.0	1.0	0.10	0.03	0.71	0.74	0.05
4	Independence Cr at Mouth	40	1.0	1.0	0.10	0.03	0.17	0.20	0.03
5	Little Truckee River above Independence Creek	45	1.0	1.0	0.10	0.07	0.35	0.42	0.04

¹ Values are mean of monthly means

² Objectives are as mg/L and defined as follows:

Cl	Chloride
Fe	Iron, Total
N	Nitrogen, Total
NO ₃ -N	Nitrogen as Nitrate
TKN	Nitrogen, Total Kjeldahl
P	Phosphorus, Total
SO ₄	Sulfate
TDS	Total Dissolved Solids (Total Filterable Residue)

Figure 3-4
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
LITTLE TRUCKEE RIVER HYDROLOGIC UNIT

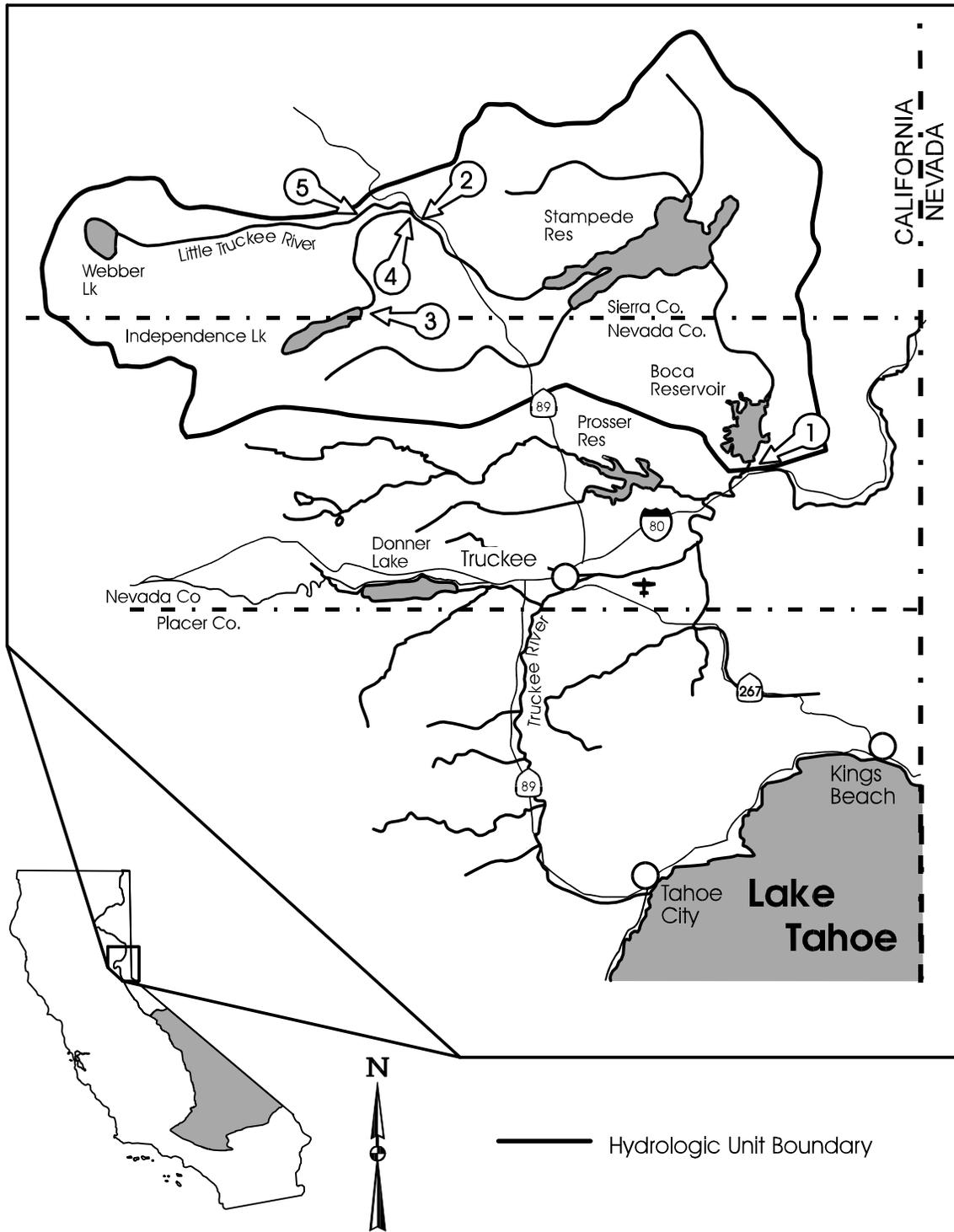


Table 3-11 (continued)
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
TRUCKEE RIVER HYDROLOGIC UNIT

See Fig. 3-5	Surface Waters	Objective (mg/L except as noted) ^{1,2}								
		TDS	Cl	SO ₄	P	B	NO ₃ -N	N	TKN	Fe
12	Truckee River above Bear Creek	65	2.0	2.0	0.02	-	0.04	0.19	0.15	0.10
13	Truckee River at Lake Tahoe Outlet	65	2.0	2.0	0.01	-	0.02	0.12	0.10	0.03

¹ Values shown are mean of monthly mean for the period of record.

² Objectives are as mg/L and are defined as follows:

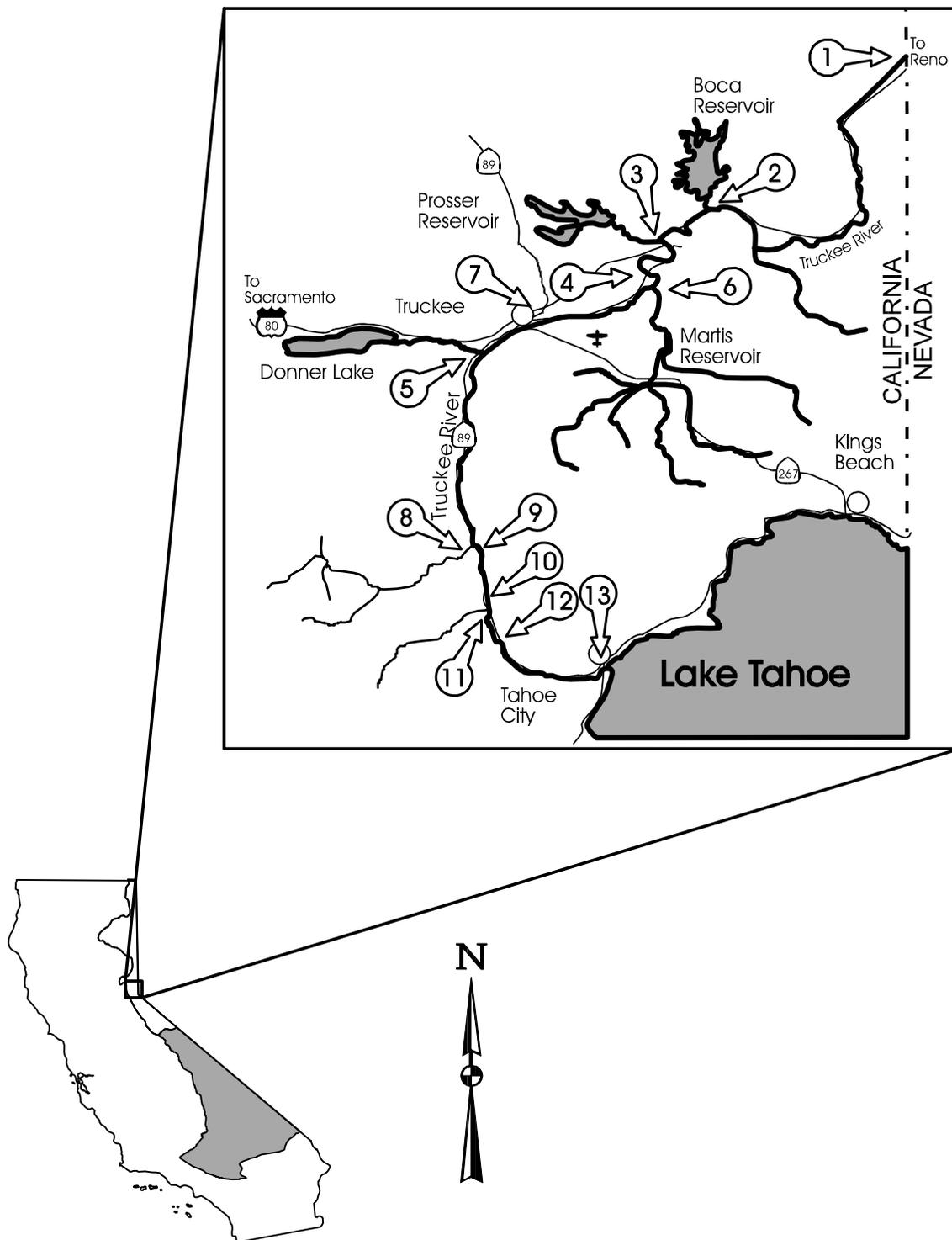
- B Boron
- Cl Chloride
- N Nitrogen, Total
- NO₃-N Nitrogen as Nitrate
- TKN Nitrogen, Total Kjeldahl
- P Phosphorus, Total
- % Na Sodium, Percent:

$$\frac{Na \cdot 100}{Na + Ca + Mg + K} = \%Na$$

Na, Ca, Mg, and K expressed as milliequivalents per liter (meq/L) concentrations.

- SO₄ Sulfate
- TDS Total Dissolved Solids (Total Filterable Residue)

Figure 3-5
WATER QUALITY OBJECTIVES FOR CERTAIN WATER BODIES
TRUCKEE RIVER HYDROLOGIC UNIT



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